

APPENDIX D

MEDICAL SURVEILLANCE, CONTROL/ACCESS TO EMPLOYEE MEDICAL RECORDS, AND EMERGENCY CARE FOR HAZARDOUS WASTE SITE OPERATIONS

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INTRODUCTION

The medical surveillance program for Hazardous Waste Site Operations is a major element in the Parsons Health and Safety Program. The three major components of the medical surveillance program are: (1) routine medical monitoring of the health of Parsons personnel whose work may expose them to health hazards, (2) arrangements for emergency medical care in the event of a work-related injury, and (3) maintenance of employee medical records.

MEDICAL SURVEILLANCE

Enrollment Criteria

A medical examination is essential to assess and monitor a worker's health and fitness both before placement and during the course of work. The criteria for medical surveillance enrollment is dependent upon the employee's exposure potential. An employee whose work involves the regular, potential exposure to toxic substances or physical agents above established OSHA permissible exposure limits (PELs), OSHA action levels, or American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLV) shall be enrolled in the medical surveillance program. Examples of operations where employee enrollment would be necessary include.

- field investigations or remedial operations at gasoline stations or bulk storage terminals;
- field investigations in a designated exclusion zone;
- work requiring respirator usage;
- laboratory use of hazardous substances;
- asbestos or lead sampling or abatement;
- stack sampling and source evaluation operations; and
- industrial wastewater and process water characterization surveys.

An employee assigned to a task where there is no reason to believe there is a potential for exposure above OSHA PELs, OSHA action levels, or ACGIH TLVs would be exempt from the medical surveillance program. Examples of exempted operations would include the following:

- project management oversight from support zone;
- site visits/walk overs without ground disturbance;
- geotechnical and land surveys without ground disturbance;
- property transfer audits where there is no environmental sampling;
- laboratory operations confined to dip and read tests; and
- ecological surveys.

Medical Oversight Contractor

Parsons has hired a medial oversight contractor (MOC) to manage its medical surveillance program. The MOC is Qualisys, 4501 Circle 75 Parkway, Suite B-2190, Atlanta, Georgia 30339, phone: 800-874-4676. The responsibilities of the MOC are:

- develop medical examination protocols specific to Parsons operations;
- contract local clinics;
- issue employee medical reports to the Facility Health and Safety Representative;
- track personnel enrolled in medical monitoring program; and
- archive employee medical and exposure records.

The MOC provides Parsons with consistency in examination content and quality.

Clinic Selection

The Parsons MOC or the Facility Health and Safety Representative perform initial clinic selection. Only after MOC approval may the clinic be used by Parsons. The Health and Safety Lead for medical surveillance issues is Mr. Edward Grunwald, located in the Atlanta office. – His telephone number is 678-969-2394.

Pre-Placement Screening

All employees who will be involved in the medical surveillance program have an initial physical examination before assignment to work requiring regular health monitoring. The pre-placement screening has two major functions: (1) to determine the employee's fitness for duty, including the ability to work while wearing protective equipment and (2) to establish a baseline physiological profile for comparison with future medical data. The physical examination will be given by an approved clinic and will follow the examination protocol established by the MOC.

Periodic Examinations

Physical examinations are repeated annually for personnel involved in HAZWOPER projects such as those at DNSC depots. Records of project personnel working at DNSC depots will be checked to ensure that periodic examination has occurred within the last year.

Termination Examination

A physical examination shall be performed as a part of the checkout procedure for terminating employees. The content of this examination shall comply with the protocol established by the MOC.

Special Examination

Special medical examinations and counseling will be provided in cases of known or suspected exposure to a toxic substance above its occupational exposure limit. Special testing must be approved by the Program Safety and Health Officer (PSHO) and Corporate H&S Manager after consulting the MOC physician.

Information Provided to the Examining Physician

Each employee participating in the medical surveillance program will present to the examining physician a completed History and Physical Form at the time of the examination. The History and Physical Form is designed to elicit information necessary for the physician to understand the employee's past and current health status. Additionally, the form provides an opportunity for the employee to express possible concerns about his or her occupational environment.

Medical Examination Reports

Data obtained during the examination is sent to the MOC physician for analysis. After reviewing the data, the MOC physician submits a report to the Parsons Health and Safety Representative. This report contains the following information:

- physician's opinion of the employee's fitness to perform their assigned duties;
- any recommended limitations upon the employee's assigned duties; and
- statement that the employee has been informed of the physician's findings and of any medical conditions that require further examination or treatment.

Additionally, the employee receives a report from the MOC physician that discusses all aspects and findings of the medical examination.

Disposition of Medical Records of Terminated Employees

When an employee is terminated from Parsons, the MOC shall seal the employee's medical file for archiving. The medical file will be maintained in the custody of the MOC for 30 years after the employee's termination date.

Confidentiality of Reports

The medical report that is submitted to the Office Health and Safety Representative or Corporate Health and Safety Manager shall not reveal any specific findings or diagnoses unrelated to occupational exposures, illnesses, or accidents. The physician's report shall be kept in the custody of the Office Health and Safety Representative in a locked file separate from the employee's personnel records. Access to the physician's report shall be limited to the Corporate Health and Safety Manager and the Office Health and Safety Representative unless authorized in writing by the employee or except where the opinions are required for settlement of workers' compensation claims.

Subcontractor's Medical Certification

Subcontractors assigned to work at the DNSC sites are required to furnish the Project Manager or PSHO a doctor's certification of each assigned employee's ability to wear personal protective equipment. The certification should be dated not more than 1 year before the employee begins on-site work.

EMERGENCY MEDICAL CARE

Emergency treatment is integrated into the Emergency Response and Fire Prevention Plan. This plan requires posting of the name, a map showing its location, phone number, and address of the nearest emergency care center. In addition, phone numbers and procedures for contacting fire, police and ambulance services are included in the emergency response portions of this plan. The Emergency Response and Fire Prevention Plan designates roles and responsibilities to be assumed by personnel in an emergency. At least two members of the field team will be currently certified in cardiopulmonary resuscitation (CPR) and first aid.

A map with directions to the nearest medical facility will be posted at the worksite. All field Managers/personnel working at the site should know the location of the nearest medical facility. The Site Safety and Health Officer (SSHO) will report all incidents requiring emergency medical attention to the PSHO or Parsons Assistant Safety Manager, Timothy Mustard.

APPENDIX E

HAZARD COMMUNICATION PROGRAM

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HAZARD COMMUNICATION PROGRAM

INTRODUCTION

The OSHA Hazard Communication (HazCom) Standard (29 CFR 1910.1200) was promulgated to ensure that all chemicals would be evaluated and information regarding the associated chemical hazards would be communicated to employers and employees. The goal of the standard is to reduce the number of chemically related occupational illnesses and injuries.

In order to comply with the OSHA Hazard Communication Standard, this written program has been established by Parsons for work at the DNSC depots. All Parsons and subcontractor personnel working at DNSC depots are included in this program. Copies of this written program will be available for review by any employee at DNSC depots – by contacting the SSHO or from the PSHO:

- William Bradford
- Parsons
- 290 Elwood Davis Road, Suite 312
- Liverpool, NY 13088
- 315-451-9560

HAZARDOUS CHEMICAL INVENTORY LIST

Hazardous chemicals used at DNSC depots include: toxic metals such as lead and mercury; volatile organic compounds (site-specific); ionizing radiation (site-specific). The SSHO will maintain an inventory of hazardous chemicals brought onto DNSC depot.

HAZARD DETERMINATION

The most hazardous chemicals potentially present at DNSC depots as contaminants of concern are mercury vapors (site-specific). These vapors are toxic; Parsons will therefore rely upon the hazard information contained in the MSDSs.

MATERIAL SAFETY DATA SHEETS (MSDS)

MSDSs are prepared by manufacturers, producers, and others, to provide specific information on the safety precautions and health effects of a particular chemical or product. The MSDS contains at a minimum the following information:

- Chemical and common names
- Physical and chemical characteristics
- Physical hazards
- Health hazards

- Primary routes of entry
- Exposure limits
- Carcinogenic potential
- Handling and protective precautions
- Control measures
- Emergency and first aid procedures
- Date of MSDS preparation
- Name and address of manufacturer (if appropriate)

MSDSs for all hazardous chemicals to which an employee of Parsons may be exposed will be kept in the PHASP and site-specific health plan annexes. MSDSs are located in Appendix C of this Safety and Health Plan. In the event that a MSDS is missing the employee should immediately contact the SSHO or PSHO.

LABELS AND OTHER FORMS OF WARNING

The Hazard Communication Standard requires that hazardous chemicals be labeled by manufacturers. The label must contain the following:

- Chemical identity
- Appropriate warnings
- Name and address of manufacturer, importer, or other responsible party.

If the labels are incomplete or missing, Parsons personnel will refuse the shipment.

When chemicals are transferred from the manufacturer's containers to secondary containers, the Site Manager or SSHO will ensure that the containers are labeled with the identity of the chemicals and appropriate hazard warnings. Labels for secondary containers can be obtained from the SSHO.

The entire labeling procedure will be reviewed at least annually and changed as necessary.

EMPLOYEE INFORMATION AND BRIEFING

Prior to starting work, Parsons and its subcontractors' employees will attend a site-specific safety and health briefing. This briefing will include Hazard Communication Briefing to review the contents of this program and convey the hazards associated with each listed hazardous chemical. The briefing will be performed by SSHO.

Training Topics

The site training or HazCom will include:

- An overview of the requirements of the Hazard Communication Standard;

- The labeling system and how to use it;
- How to review MSDS and where they are kept;
- Chemicals present in work operations;
- Physical and health effects of hazardous chemicals;
- Methods and observation techniques used to determine the presence or release of hazardous chemicals in the area;
- Personal protective equipment and work practices to reduce or prevent exposure to chemicals;
- Steps to be taken to prevent or reduce exposure to chemicals;
- Safety-emergency procedures to follow if exposure occurs; and
- Location and availability of written program/MSDSs.

Following the training session(s), each employee will sign and date the training record. Additional training may be provided by the SSHO with the introduction of each new hazardous chemical. Records of additional training will be maintained.

ON-SITE CONTRACTORS AND VISITORS

Parsons understands that at times other persons may be on the work site. New contractors, subcontractors and visitors will be required to attend site health and safety briefing to familiarize them with the contents of this document and the specific hazards associated with DNSC depots. New contractors, subcontractors and visitors will be provided with the following information:

- Hazardous chemicals to which the contractor's employees or visitors may be exposed;
- Precautions necessary to protect employees during normal operating conditions and foreseeable emergencies; and
- Labeling system used in the work place.

It is the responsibility of the SSHO to ensure that all MSDSs of chemicals to which the contractor's employees or visitors may be exposed are made available at a central location in the work place along with an example of the labeling system in use. Visitors and subcontractors will be informed of the availability of this information and its location.

PROGRAM REVIEW

This written hazard communications program for Parsons will be reviewed by the PSHO or Corporate Health and Safety Manager at least annually and updated as necessary.

SIGNATURE SHEET

Plan Preparer: Parsons Safety and Health Representative

_____	_____	_____
Name	Title	Phone Number

_____	_____
Signature	Date

Plan Concurrence: Parsons Project Manager

_____	_____	_____
Name	Title	Phone Number

_____	_____
Signature	Date

STATEMENT OF HEALTH AND SAFETY POLICY

It is Parsons' Health and Safety Policy to:

- *Provide a safe and healthful work environment.*
- *Minimize the risk of human and economic losses resulting from accidents.*
- *Comply with all applicable safety and health laws and regulations.*
- *Protect the environment from degradation.*
- *Satisfy the requirements of its clients.*

ACTIVITY HAZARD ANALYSIS

Activity: BRUSH CLEARING AND DEBRIS REMOVAL

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Cut vegetation and removal of vegetation and debris to allow access for the intrusive operations.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Vehicle and heavy equipment traffic in work area	Operate heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn and the hazard posted in hazardous noise areas.
	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Back injury	SSHO to provide training in proper lifting techniques at start of activity.

Potential Equipment to be used: Fork-lift, front-end loader, shovels, bush hog, chain saw, weed wackers, and power tools.

Inspection Requirements: A daily inspection of PPE by workers will be conducted. Equipment will be inspected daily by workers prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced. The SSHO will inspect loading locations at least daily.

Training Requirements: Operators will be trained in the safe use of required equipment and in the required personal protective equipment. All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). At Curtis Bay Depot, any UXO Personnel must be certified as EOD-trained and must be approved for the project by the USAESCH Safety Officer and Contracting Officer. All personnel operating heavy equipment will provide proof of competency with the equipment to the SSHO prior to operating the equipment.

ACTIVITY HAZARD ANALYSIS

Activity: DIGITAL GEOPHYSICAL MAPPING

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Gather geophysical data on subsurface anomalies by carrying instruments across the site.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Vehicle and heavy equipment traffic in work area	Operate heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Back injury	SSHO to provide training in proper lifting techniques at start of activity.

Equipment to be used: Geophysical instruments.

Inspection Requirements: A daily inspection of PPE by workers will be conducted. Equipment will be inspected daily by workers prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced. The SSHO will inspect loading locations at least daily.

Training Requirements: Operators will be trained in the safe use of required equipment and in the required personal protective equipment. All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All personnel operating heavy equipment will provide proof of competency with the equipment to the SSHO prior to operating the equipment.

ACTIVITY HAZARD ANALYSIS

Activity: GEOPHYSICAL SURVEYS AND LAND SURVEYING

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Locate anomalies and sample points selected for intrusive investigation.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
Uses stakes or flags to mark the locations and extent of areas to be investigated.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
Clear lines of sight using hand tools where needed.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Back injury	SSHO to provide training in proper lifting techniques at start of activity.

Activity: GEOPHYSICAL SURVEYS AND LAND SURVEYING

Equipment to be used: GPS and shovels.

Inspection Requirements: A daily inspection of PPE by workers will be conducted. Equipment will be inspected daily by workers prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced. The SSHO will inspect loading locations at least daily.

Training Requirements: Operators will be trained in the safe use of required equipment and in the required personal protective equipment. All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All personnel operating heavy equipment will provide proof of competency with the equipment to the SSHO prior to operating the equipment.

ACTIVITY HAZARD ANALYSIS

Activity: INITIAL INTRUSIVE EXCAVATION

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Setup / Preparation for excavation	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Vehicle and heavy equipment traffic in work area	Operate heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn and the hazard posted in hazardous noise areas.
Hand digging	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Underground Utilities	The local utility locating hotline will be contacted at least 5 days before work starts to identify the locations of buried utilities before subsurface activities are allowed to commence (see checklist in Appendix B).
Mechanical Excavation	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Vehicle and heavy equipment traffic in work area	Operate heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn and the hazard posted in hazardous noise areas.

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
	Underground Utilities	The local utility locating hotline will be contacted at least 5 days before work starts to identify the locations of buried utilities before subsurface activities are allowed to commence (see checklist in Appendix B).
	Excavation and trenching	Install shoring or implement benching/sloping when excavation wall stability is in question. Periodic trench inspections by the SSHO. No one will enter trench under any circumstances.
Collect environmental samples	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements..
	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.

Equipment to be used: Excavator, shoring, and hand tools.

Inspection Requirements: A daily inspection of PPE by workers will be conducted. Equipment will be inspected by workers daily prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced. The SSHO will inspect or survey excavation at least daily or right after changes in conditions (i.e., heavy rain, large amounts of soil removed). The SSHO will look for fissures and cracks in the walls and will assess whether engineering controls are appropriate. During site set-up, equipment generating noise will be monitored by the SSHO to determine whether or not hearing protection is required.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). Operators will be trained in the safe use of required equipment and in the required personal protective equipment. At Curtis Bay, any UXO Personnel must be certified as EOD-trained and must be approved for the project by the USAESCH Safety Officer and Contracting Officer. Before entering a confined space, all personnel will show proof of confined space training to the SSHO. All personnel operating heavy equipment will provide proof of competency with the equipment to the SSHO prior to operating the equipment.

ACTIVITY HAZARD ANALYSIS

Activity: PERSONNEL DECONTAMINATION STATION

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Decontaminate personnel exiting from the EZ.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Slips trip and falls	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold/heat injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
Decontaminate tools.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Slips trip and falls	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold/heat injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
Support rescue personnel (as required).	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Slips trip and falls	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold/heat injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Back injury	SSHO to provide training in proper lifting techniques at start of activity.

Equipment to be used: Decon buckets, brush, detergent, and water.

Inspection Requirements: Equipment will be inspected by workers daily prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/ replacement. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired or replaced. The SSHO will ensure prior to daily operations that the PDSs are ready for operations.

Training Requirements: All personnel will be trained in the safe use of required equipment and in the required personal protective equipment. All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f).

ACTIVITY HAZARD ANALYSIS

Activity: AIR MONITORING

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Calibrate and set up air monitoring equipment.	Contact with hazardous chemicals	All personnel will don the proper PPE commensurate with the chemical hazard. SSHO to conduct safety awareness training during site specific training and refresh during morning tailgate briefing. Use goggles as appropriate.
	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Vehicle and heavy equipment traffic in work area	Operation of heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn in hazardous noise areas.
Air monitoring	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Noise	Hearing protection will be worn in hazardous noise areas.

Equipment to be used: PID, Jermoe mercury vapor analyzer and portable sampling pumps.

Inspection Requirements: All air monitoring equipment will be inspected and calibrated daily prior to use by air monitoring team. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair or replacement.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f).

ACTIVITY HAZARD ANALYSIS

Activity: DRUM HANDLING

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Transfer drums from transport vehicle	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Vehicle and heavy equipment traffic in work area	Operation of heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn in hazardous noise areas.
	Back injury	Proper lifting techniques.
Drum Transport	Vehicle and heavy equipment traffic in work area	Operation of heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide
	Noise	Hearing protection will be worn in hazardous noise areas.

Equipment to be used: Drum dolly and forklift.

Inspection Requirements: All PPE will be inspected daily by workers prior to use.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All personnel operating heavy equipment will provide proof of competency with the heavy equipment to the SSHO prior to operating.

ACTIVITY HAZARD ANALYSIS

Activity: EXCAVATION BACKFILL

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Backfill excavation.	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Vehicle and heavy equipment traffic in work area	Operation of heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide
	Noise	Hearing protection will be worn in hazardous noise areas.
Compacting soil.	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Vehicle and heavy equipment traffic in work area	Operation of heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide
	Noise	Hearing protection will be worn in hazardous noise areas.
Seeding.	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.

Equipment to be used: Loader, hand tools, compactor, and excavator.

Inspection Requirements: All excavator, compactor equipment will be inspected prior to use. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/ replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired or replaced.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a

medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All personnel operating heavy equipment will provide proof of competency to the SSHO prior to operating.

ACTIVITY HAZARD ANALYSIS

Activity: PROJECT MOBILIZATION / DEMOBILIZATION

Principal Steps	Potential Safety/Health Hazards:	Recommended Controls
Assemble / Disassemble support area.	Tripping hazards	SSHO to conduct worker awareness of potential slippery surfaces and tripping hazards during site specific training and refresh during morning tailgate briefing.
	Cold and heat stress injuries	SSHO to implement heat stress/cold injury control program per HASP requirements.
	Biological hazards	Site personnel have received blood-borne pathogen training during site-specific training.
	Vehicle and heavy equipment traffic in work area	Operate heavy equipment in accordance with the HASP. Be alert when working around heavy equipment. Ground guide for the backing of all vehicles. No heavy equipment will be operated without a ground guide.
	Noise	Hearing protection will be worn and the hazard posted in hazardous noise areas.
	Hand tools	All tools will be in good working order. No damaged equipment will be used until repaired or replaced.
	Back injury	SSHO to provide training in proper lifting techniques at start of activity.

Equipment to be used: Common hand tools and vehicles.

Inspection Requirements: All equipment will be inspected daily by workers prior to use. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/ replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired or replaced.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All personnel operating heavy equipment will provide proof of competency with the equipment to the SSHO prior to operating.

APPENDIX F

DRILLING SAFETY GUIDE

Drilling Safety Guide

DRILLING SAFETY GUIDE

The *Drilling Safety Guide* has been prepared through the combined efforts of member delegations of the Diamond Core Drill Manufacturers Association (DCDMA), the National Drilling Contractors Association (NDCA) and the National Water Well Association-Drill Rig/Heavy Equipment Products Group (NWWA) and is published by the International Drilling Federation for the benefit of the drilling industries.

This guide contains suggested safety procedures. It is not intended to set forth any standard industry procedures or requirements. This manual is to be used as a guideline for the safe operation of drilling equipment. IDF, DCDMA, NDCA, NWWA, their officers, and members deny any liability for any injury to people or property that may occur even if these procedures are properly followed. Further, the IDF, DCDMA, NDCA, NWWA, their officers, and members do not accept responsibility for the completeness of the guide or the applicability of the statements or procedures to the use of all drilling machines and tools in all environments. Many aspects of drilling safety cannot be expressed in detail and cannot be met by mechanical means; drilling safety can only be accomplished with the exercise of intelligence, care, and common sense.



INTERNATIONAL DRILLING FEDERATION

DCDMA
The Drilling Equipment
Manufacturers
Association

NDCA
National Drilling
Contractors
Association

CDDA
Canadian Diamond
Drilling
Association



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DRILLING SAFETY GUIDE

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DRILLING SAFETY GUIDE

. An Introduction To Drilling Safety

The organization for which you work is interested in your safety. Your employer cares about your safety not only when you are working on or around a drill rig, but also when you are traveling to and from a drilling site, moving the drill rig and tools from location to location on a site, or providing maintenance on a drill rig or drilling tools. This safety guide is for your benefit. Failure to heed the safety procedures contained in this manual could result in serious injury or death.



Every drill crew should have a designated safety supervisor who has the authority to enforce safety on the drilling site. A rig worker's first safety responsibility is to obey the directions of the safety supervisor.

2. Governmental Regulations

All local, state, and federal regulations or restrictions, currently in effect or effected in the future, take precedence over the recommendations and suggestions which follow. Government regulations will vary from country to country and from state to state.

3. The Safety Supervisor

The safety supervisor for the drill crew will, in most cases, be the drill rig operator. The safety supervisor must:

- Consider the "responsibility" for safety and the "authority" to enforce safety to be a matter of first importance.
- Be the leader in using proper personal safety gear and set an example in following the rules that are being enforced on others.
- Enforce the use of proper personal protective safety equipment and take appropriate corrective action when proper personal protective safety equipment is not being used.
- Understand that proper maintenance of tools and equipment and general "housekeeping" on the drill rig will provide an environment that will promote and enforce safety.
- Before drilling is started with a particular drill, ensure that anyone who operates the drill has had adequate training and is thoroughly familiar with the drill rig, its controls, and its capabilities.
- Inspect the drill rig at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, and/or damaged pressure gauges and pressure relief valves.
- Check and test all safety devices, such as emergency shut-down switches, at least daily and preferably at the start of a drilling shift. Drilling must not be permitted until all emergency shut-down and warning systems are working correctly. Do not allow any emergency device to be bypassed or removed.
- Check that all gauges, warning lights, and control levers are functioning properly and listen for unusual sounds each time an engine is started.
- Ensure that every drill rig worker is informed of safe operat-

worker with a copy of the organization's drilling operations safety manual, and when appropriate, the drill rig manufacturer's operations and maintenance manual. Ensure that every employee reads and understands the safety manual.



- Carefully instruct a new worker in drilling safety and observe the new worker's progress towards understanding safe operating practices.
- Assess the mental, emotional, and physical capability of each worker to perform the assigned work in a proper and safe manner. Remove any worker from the drill site whose mental and physical capabilities might cause injury to the worker or coworkers.
- Ensure that a first-aid kit and a fire extinguisher, which are properly maintained, are on each drill rig and each additional vehicle.
- Be well trained in and capable of using first-aid kits, fire extinguishers, and all other safety devices and equipment. Train crew members.

maintain a list of addresses and telephone numbers for emergency assistance units (ambulance services, police, hospitals, etc.) and inform other members of the drill crew of the existence and location of the list.

4. Individual Protective Equipment

For most geotechnical, mineral, and/or groundwater drilling projects, individual protective equipment must include a safety hat, safety shoes, safety glasses, and close-fitting gloves and clothing. The clothing of the individual drill rig worker is not generally considered protective equipment; however, the worker's clothing should be comfortable but must be close fitting, without loose ends, straps, draw strings, belts or otherwise unfastened parts that might catch on some rotating or translating component of the drill rig. Rings and jewelry must not be worn during a work shift.

- **Safety Head Gear.** Safety hats (hard hats) must be worn by everyone working or visiting at or near a drilling site. All safety hats must meet the requirements of ANSI Z89.1. All safety hats must be kept clean and in good repair with the headband and crown straps properly adjusted for the individual drill rig worker or visitor.

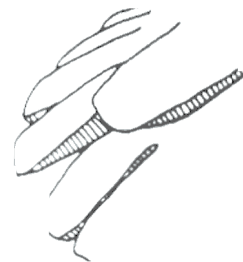
- **Safety Shoes or Boots.** Safety shoes or boots must be worn by all drilling personnel and all visitors to the drill site that observe drilling operations within close proximity of the drill rig. All safety shoes or boots must meet the requirements of ANSI Z41.1.

- **Gloves.** All drilling personnel must wear gloves for protection against cuts and abrasions that could occur while handling wire rope or cable and from contact with sharp edges and burrs on drill rods and other drilling or sampling tools. All gloves must be close fitting and not have large cuffs or loose ties that can catch on rotating or translating components of the drill rig.

- **Safety Glasses.** All drilling personnel must wear safety glasses. All safety glasses must meet the requirements of ANSI Z87.1.

- **Other Protective Equipment.** For some drilling operations, the environment or regulations may dictate that other protective equipment be used. The requirement for such equipment must

be determined jointly by the management of the drilling organization and the safety supervisor. Such equipment might include face or ear protection or reflective clothing. Each drill rig worker must wear noise-reducing ear protectors when appropriate.



5. Housekeeping On and Around the Drill Rig

The first requirement for safe field operations is that the safety supervisor understand and fulfill the responsibility for maintenance and "housekeeping" on and around the drill rig. The safety supervisor must:

- Provide suitable storage locations for all tools, materials, and supplies so that these items can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.
- Avoid storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig, unless designed for this purpose.
- Stack pipe, drill rods, casing, augers, and similar drilling tools in orderly fashion on racks or sills to prevent spreading, rolling, or sliding.
- Place penetration or other driving hammers at a safe location on the ground or secure them to prevent movement when not in use.
- Keep work areas, platforms, walkways, scaffolding, and other accessways free of materials, debris, obstructions, and substances such as ice, grease or oil that could cause a surface to become slick or otherwise hazardous.
- Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease, and/or ice.
- Store gasoline only in a non-sparking, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

6. Maintenance

Good maintenance will make drilling operations safer. Also, maintenance must be performed safely. The following points are essential to safety:

- Wear safety glasses when performing maintenance on a drill rig or on drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running). Take precautions to prevent accidental starting of an engine during maintenance by removing or tagging the ignition key.

- Block the wheels or lower the leveling jacks or both and set handbrakes before working under a drill rig.
- Release all pressure on the hydraulic systems, the drilling fluid system and the air pressure systems of the drill rig — when possible and appropriate — prior to performing maintenance. In other words, reduce the drill rig and operating systems to a "zero energy state" before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have had adequate time to cool.



- Never climb the mast (derrick) to do maintenance or make repairs. Lower mast, stop engine and deenergize rig before starting maintenance or repair on mast.
- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.

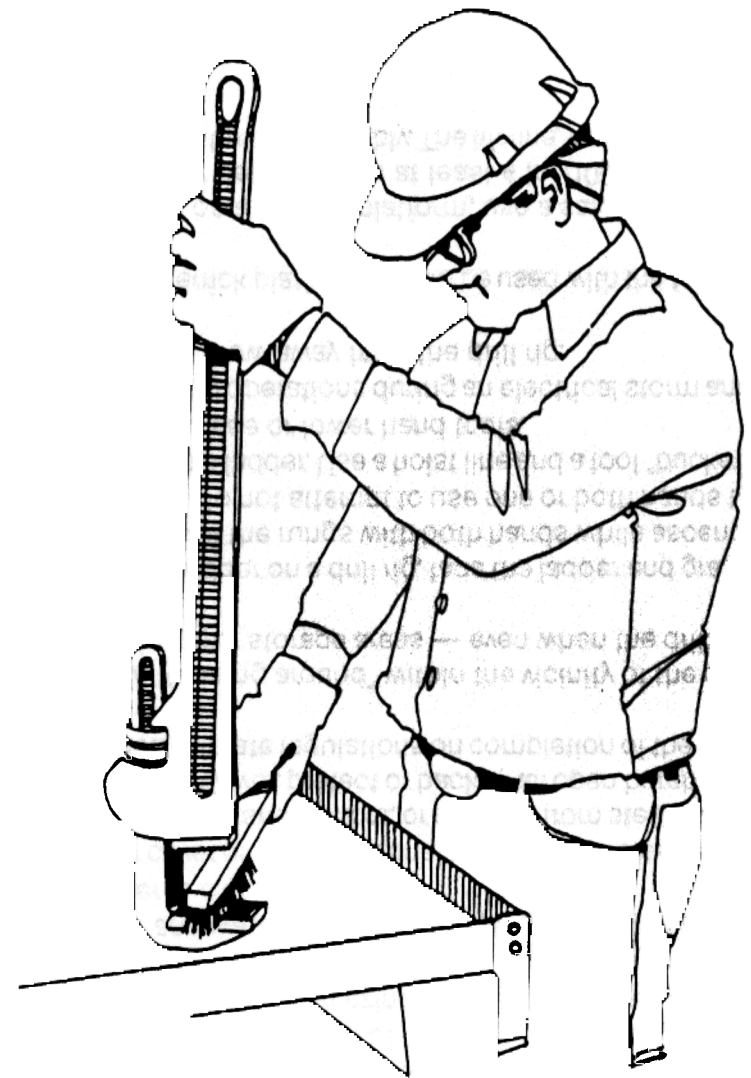
• Follow the manufacturer's recommendations for applying proper quantity and quality of lubricants, hydraulic oils and coolants.

- Replace all caps, filler plugs, protective guards or panels, and high pressure hose clamps and chains or cables that have been removed for maintenance before returning the drill rig to service.

7. Hand Tools

Since there are almost an infinite number of hand tools that can be used on or around a drill rig and in repair shops, there are an equal number of instructions for proper use. "Use the tool for its intended purpose" is the most important rule. The following suggestions apply to safe use of several hand tools that frequently are used on and around drill rigs:

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- When using any kind of chisel or punch, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored appropriately when not in use.
- Use wrenches — not pliers — on nuts.
- Use screwdrivers with blades that fit the screw.
- When using a wrench on a tight nut, first use some penetrating oil and then use the largest wrench available that fits the nut. When possible pull on the wrench handle rather than push on it; apply force to the wrench with both hands when possible and with both feet firmly placed. Always assume that you may lose your footing; check the place that you may fall for sharp objects.
- Keep all pipe wrenches clean and in good repair. Use a wire brush frequently to clean the jaws of pipe wrenches. An accumulation of dirt and grease can cause wrenches to slip.
- Never use pipe wrenches in place of a rod-holding device.
- Replace hook and heel jaws when they become visibly worn.



- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform if the wrench should slip or the tool joint suddenly let go.

8. Clearing the Work Area

Prior to drilling, adequately clear and level the site to accommodate the drill rig and supplies and provide a safe working area.

Do not begin drilling if tree limbs, unstable ground, or obstructions cause unsafe tool handling conditions.

9. Start-Up

Instruct all drill rig personnel and visitors to "stand clear" of the drill rig immediately prior to starting the engine.

- Make sure all brakes are set, all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers or air controls are in the correct positions, and the cathead rope is not on the cathead before starting a drill rig engine.
- Start all engines according to the manufacturer's manual.

10. Drilling Operations

Safety requires the attention and cooperation of every worker and site visitor.

- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions. (Refer to Section 11 on Overhead and Buried Utilities.)
- Before raising the mast (derrick), clear all drill rig personnel (with exception of the operator) and visitors from the areas immediately to the rear and the sides of the mast. Inform all drill rig personnel and visitors that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is begun, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. Relevel the drill rig if it settles after initial set up. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- Before starting drilling operations, secure, and/or lock the mast (derrick) if required, according to the drill manufacturer's recommendations.
- Do not stand on the elevated deck of a truck-mounted or all-terrain-mounted drill rig while the drill rig is in operation unless necessary for special tasks and the operator has been notified.
- Only operate a drill rig from the position of the controls. Before leaving the area of the controls, shift the transmission

controlling the rotary drive into neutral and place the feed lever in neutral. Before leaving the vicinity of the drill, shut down the drill engine.

- Throwing or dropping tools must not be permitted. Carefully pass tools by hand between personnel or use a hoist line.
- Do not consume alcoholic beverages, other depressants, or chemical stimulants prior to starting work on a drill rig or while on the job.
- If it is necessary to drill within an enclosed area, make certain that exhaust fumes are conducted out of the area. Exhaust fumes are toxic and some cannot be detected by smell.
- Clean mud and grease from boots before stepping on a drill platform and use hand holds and railings. Watch for slippery ground when stepping down from the platform.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- Drain all air and water lines and pumps when not in use if freezing weather is expected.
- Adequately cover or protect all unattended boreholes to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. Cover, protect or backfill all open boreholes according to local or state regulations on completion of the drilling project.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas — even when the drill rig is shut down.
- When using a ladder on a drill rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.
- Terminate drilling operations during an electrical storm and move the complete crew away from the drill rig.

An elevated derrick platform should be used with the following precautions:

- When working on a derrick platform, use a safety belt and a lifeline. The safety belt must be at least 4 in. (100 mm) wide and should fit snugly but comfortably. The lifeline, when attached

to derrick, must be less than 6 ft. (2 m) long. The safety belt and lifeline must be strong enough to withstand the dynamic force of a 250 lb. (115 kg) weight (contained within the belt) falling 6 ft. (2 m).

- Use a safety device when climbing to a derrick platform that is higher than 20 ft. (6 m).
- When on a derrick platform, fasten the lifeline to the derrick just above the derrick platform and to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- When first arriving at a derrick platform, immediately inspect for broken members, loose connections, loose tools, or other loose materials.
- Securely attach tools to the platform with safety lines. Do not attach a tool to a line attached to one's wrist or any other part of the body.
- When working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Do not leave loose tools and similar items on the derrick platform or on structural members of the derrick.
- A derrick platform over 4 ft. (1.2 m) above ground surface must have toe boards and safety railing that are in good condition.
- Avoid being under rig workers on elevated platforms whenever possible.

If heavy objects must be manually lifted, exercise care to avoid injury.

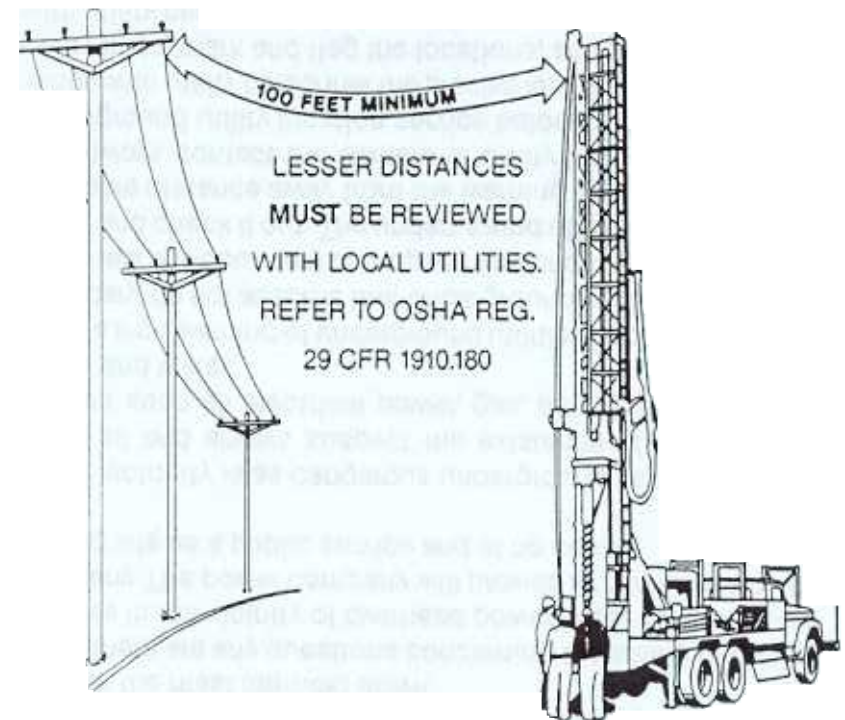
- Before lifting an object without using a hoist, make sure that the load is within your personal lifting capacity. If it is too heavy, ask for assistance.
- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping the back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping the back vertical and unarched. In other words, perform the lifting with the muscles in the legs, not with the muscles in the lower back.
- If a heavy object must be moved some distance without the aid of machinery, keep the back straight and unarched. Change directions by moving the feet, not by twisting the body.

- Move heavy objects with the aid of hand whenever possible.

11. Overhead and Buried Utilities

Both supervisors and members of the exploration crew must take special precautions when a drill rig will be used on a site or project within the vicinity of electrical power lines and other utilities. Electricity can shock, it can burn, and it can cause death.

- Locate, note, and emphasize overhead and buried utilities on all boring location plans and boring assignment sheets.
- When overhead electrical power lines exist at or near a drilling site or project, consider all wires to be alive and dangerous.





- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the utility and ask them to lift or raise the lines or deenergize (turn off) the power.
- Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine the minimum horizontal distance from any point on the drill rig

to the nearest power line when the mast is raised and/or being raised. If this horizontal distance is less than 100 ft. (30 m), first consult the local utility company and refer to OSHA REG 29 CFM 1910.180 before commencing operations.

- Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.
- In order to avoid contact with power lines, only move the drill rig with the mast (derrick) down.
- If there are any questions concerning the safety of drilling on sites in the vicinity of overhead power lines, call the power company. The power company will provide expert advice at the drilling site as a public service and at no cost.

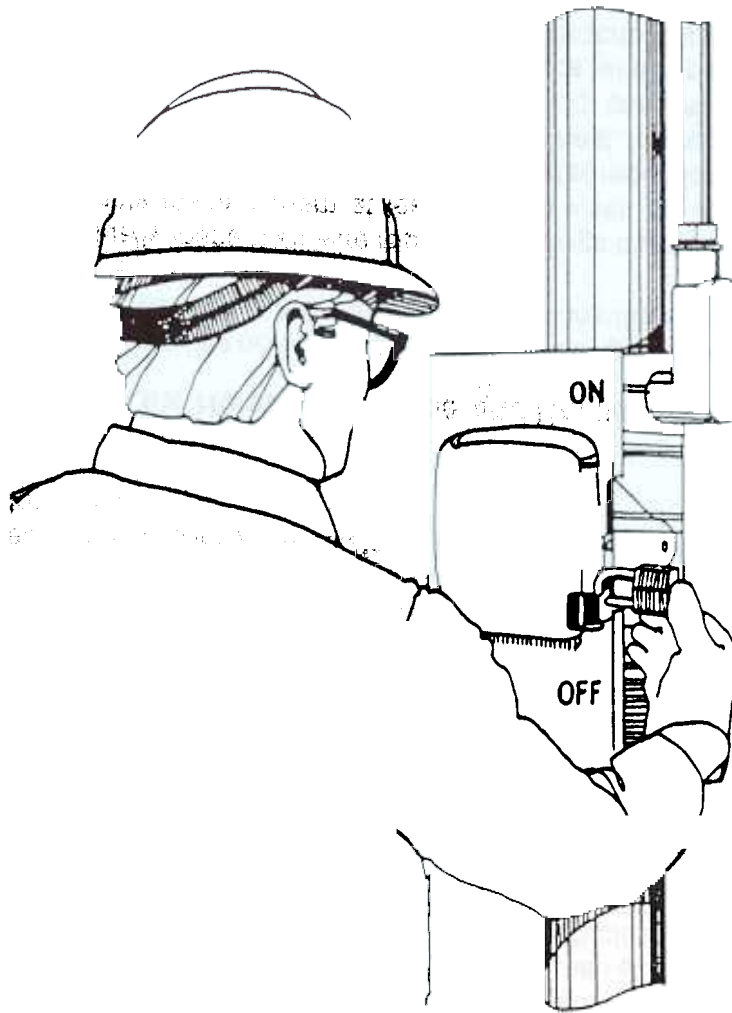
Electricity is as dangerous underground as overhead. Be aware of and always suspect the existence of underground utilities such as electrical power, gas, petroleum, telephone, sewer and water.

- If a sign warning of underground utilities is located on a site boundary, do not assume that underground utilities are located on or near the boundary or property line under the sign. Call the utility and check it out. The underground utilities may be a considerable distance away from the warning sign.
- Always contact the owners of utility lines or the nearest underground utility location service before drilling. Determine jointly with utility personnel the precise location of underground utility lines, mark and flag the locations, and determine jointly with utility personnel what specific precautions must be taken to ensure safety.

12. Supplying Power to the Job Site

Drilling projects sometimes require around-the-clock operations and, therefore, require temporary electrical lighting. In general, all wiring and fixtures used to provide electricity for drilling operations should be installed by qualified personnel in accordance with the National Electrical Code (NFPA70-1984) with consideration of the American Petroleum Institute's recommended practices for electrical installations for production facilities (API-RP-500B). Lights should be installed and positioned so that the work area and operating positions are well

light without shadows or blind spots. The following are specific recommendations for land-based drilling operations:



- Before working on an electrical power or lighting system, lock-out the main panel box with your own lock and keep the key on your person at all times.
- Install all wiring using high quality connections, fixtures and wire. Be sure that the wiring is insulated and protected with consideration for the drilling environment. Do not use makeshift

wiring and equipment.

- Place all lights positioned directly above working areas in cages or similar enclosures to prevent loose or detached lamps or vaportight enclosures from falling on workers.
- Install lights so as to eliminate glare or "blind spots" on tools, ladders, walkways, platforms, and the complete working area.
- Locate and guard electrical cables to prevent damage by drilling operations or by the movement of personnel, tools, or supplies.
- Use only three-prong, U-blade, grounded type plug receptacles and have adequate current carrying capacity for the electrical tools that may be used.
- Use only electrical tools that have three-prong, U-blade, ground wire plugs and cords.
- Do not use electrical tools with lock-on devices.
- Provide adequate grounding for all electrical welders, generators, control panels, and similar devices.
- Provide secure protective enclosures on control panels, fuse boxes, transformers, and similar equipment.
- Avoid attaching electrical lighting cables to the derrick or other components of the drill rig. If this must be done, use only approved fasteners. Do not "string" wire through the derrick.
- Do not use poles used to hold wiring and lights for any other purpose.
- Turn power off before changing fuses or light bulbs.
- Require all workers in a drilling area illuminated with electrical lighting to wear safety head gear that protects the worker's head, not only against falling or flying objects, but also against limited electrical shock and burns according to ANSI Z89.1 and Z89.2.
- Allow only trained, designated personnel to operate electrical equipment.
- Do not permit unqualified field personnel to work on or near electric lines or devices.

13. Contact with Electricity

If a drill rig makes contact with electrical wires, it may or may not be insulated from the ground by the tires of the carrier. Under either circumstance, if the human body simultaneously

comes in contact with the drill rig and the ground, electrocution can result, causing death or serious injury. If a drill rig or a drill rig carrier makes contact with overhead or underground electrical lines:

- Under most circumstances the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. They should not move or touch any part, particularly a metallic part, of the vehicle or the drill rig.
- If it is determined that the drill rig should be vacated, all personnel must jump clear and as far as possible from the drill. Personnel must not step off — but must jump off. Do not hang on to the vehicle or any part of the drill when jumping clear.
- If you are on the ground, stay away from the vehicle and the drill rig; do not allow others to get near the vehicle and the drill rig. Seek assistance immediately from local emergency personnel such as the police or a fire department.
- When an individual is injured and in contact with the drill rig or with power lines, attempt rescue with extreme caution. If a rescue is attempted, use a long, dry, unpainted piece of wood or a long, dry, clean rope. Keep as far away from the victim as possible and do not touch the victim until the victim is completely clear of the drill rig or electrical lines.
- Do not attempt to administer first aid unless the victim is completely clear of the electrical source. Begin cardiopulmonary resuscitation (CPR) immediately if a heart beat (pulse) cannot be detected.

14. Wire Line Hoists, Wire Rope, and Hoisting Hardware

Use wire line hoists, wire rope, and hoisting hardware only as stipulated by the American Iron and Steel Institute *Wire Rope Users Manual*.

- Visually inspect all wire ropes and fittings during use and thoroughly inspect them at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, and/or damage to lifting hardware. Replace wire ropes when inspection indicates excessive damage, as described in the *Wire Rope Users Manual*.

- Thoroughly inspect all wire ropes that have not been used for a period of a month or more.

- Install all connections and end fittings, which consist of spliced eyes and various manufactured devices, according to the manufacturer's specifications. Do not exceed ratings specified by manufacturer.

- If a ball-bearing type hoisting swivel is used to hoist drill rods, inspect and lubricate swivel bearing daily to assure that the swivel freely rotates under load.

- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device; do not hoist more than 1 ft. (0.3 m) of the drill rod column above the top of the mast (derrick); do not hoist a rod column with loose tool joints; and do not make, tighten, or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to break the fall of the rods by hand or by tensioning the slipping device.

- Most sheaves on exploration drill rigs are stationary with a single part line. Never increase the number of parts of line without first consulting with the manufacturer of the drill rig.

- Wire ropes must be properly matched with each sheave. If the rope is too large, the sheave will pinch the wire rope. If the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger-sized wire ropes.

The following procedures and precautions must be understood and implemented for use of wire ropes and rigging hardware:

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however, drills may be moved using the main hoist of the drill if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

- When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or to the feed mechanism of the drill.

- When attempting to pull out a mired down vehicle or drill rig, only use a winch on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.

- Apply loads smoothly and steadily to minimize shock loading of a wire rope.

- Avoid sudden loading in cold weather.
- Never use frozen ropes.
- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Replace damaged latches on hooks before using.
- Know the working load of the equipment and tackle being used. Never exceed this limit.

- Periodically inspect and test hoist clutches and brakes.
- Know and do not exceed the rated capacity of mast hooks, rings, links, swivels, shackles, and other lifting aids.

- Always wear gloves when handling wire ropes.
- Do not use hands to guide wire rope on hoist drums.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.

- Never conduct any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.

- Never leave a load suspended in the air when the hoist is unattended.

- Keep hands away from hoists, wire rope, hoisting hooks, sheaves, and pinch points while slack is being taken up or when the load is being hoisted.

- Never hoist the load over the head, body, or feet of any personnel.

- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.

- Use replacement wire ropes that conform to the drill rig manufacturer's specifications.

15. Cathead and Rope Hoists

Follow these procedures when using a cathead hoist:

- Keep the cathead clean and free of rust, oil, and grease. Rust should be removed from the cathead with a wire brush having a handle.

- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 in. (3 mm), replace the cathead.

- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.

- Should the rope "grab" the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel, including the operator, to rapidly back away and stay clear. If the rope "grabs" the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. Keep careful watch on the suspended tools and quickly back away after turning off the engine.

- Always protect the rope from contact with chemicals. Chemicals can cause deterioration of the rope that may not be detected visibly.

- Never wrap the rope from the cathead (or any other rope, wire rope, or cable on the drill rig) around a hand, wrist, arm, foot, ankle, legs, or any other part of the body.

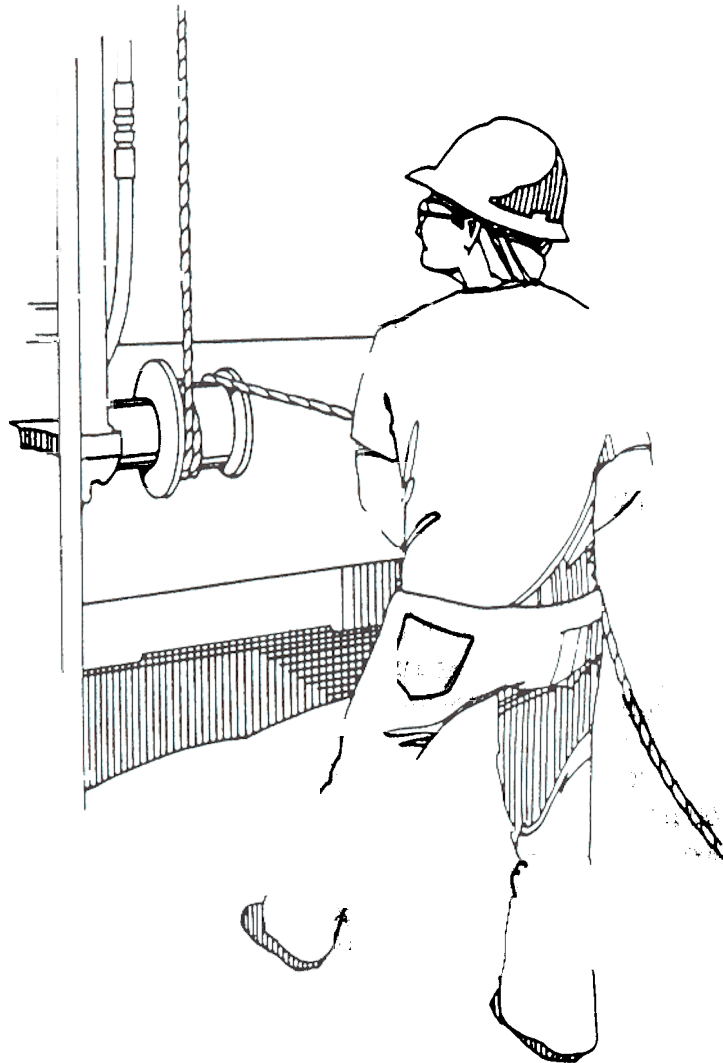
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing, or other tools with the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.

- Never operate a cathead (or perform any other task around a drill rig) with loose, unbuttoned, or otherwise unfastened clothing or when wearing gloves with large cuffs or loose straps or lacing.

- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.

- Do not use more rope wraps than are required to hoist a load.

- Do not leave a cathead unattended with the rope wrapper on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.



- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.

- Only operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

16. Augers

Follow these general procedures when starting a boring with continuous flight or hollow-stem augers:

- Start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or on the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.

Establish a system of responsibility for the operator and tool handler to follow during the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must ensure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation. In addition:

- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not use an over-length pin or bolt. Do not touch the coupling or the auger with hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger

ser when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.

- Never allow feet to get under the auger section that is being hoisted.
- Use a long-handed shovel to move auger cuttings away from the auger. Never use hands or feet to move cuttings away from the auger.
- Do not attempt to remove earth from rotating augers. Clean augers only when the drill rig is in neutral and the augers are stopped from rotating.

17. Rotary and Core Drilling

Check rotary drilling tools prior to drilling:

- Lubricate and check for frozen bearings before using water/air swivels and hoisting plugs. Water/air swivel bearings must be free before using, and stay clear of water/air swivel hose when rotating.
- Check drill rod chuck jaws periodically and replace when necessary.
- Check the capacities of hoists and sheaves against the anticipated weight to the drill rod string plus other expected hoisting loads.

During rotary or core drilling, follow these special precautions that involve chucking, joint break, hoisting, and lowering of drill rods:

- Only the operator of the drill rig should be allowed to brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Do not lower drill rods into the hole with pipe wrenches.
- If a string of drill rods is accidentally or inadvertently released into the hole, do not attempt to grab the falling rods by hand or with a wrench.
- In the event of a plugged bit or other circulation blockage, relieve the high pressure in the piping and hose between the pump and the obstruction before breaking the first tool joint.

When drill rods are hoisted from the hole, run them only with a wiper made of rubber or other suitable material. Do not use hands to clean drilling fluid from drill rods.

- If work must progress above a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. Equip the mud pit with rough surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Do not lift or lean unsecured drill rods against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

18. Transporting a Drill Rig

When transporting a drill rig on and off a drilling site:

- Allow only licensed individuals to operate the vehicle. Comply with all federal, state, and local regulations.
- Know the traveling height (overhead clearance), width, length, and weight of the drill rig with carrier and know the highway and bridge load, width, and overhead limits. Allow adequate margins and make sure that they are not exceeded.
- Never move a drill rig unless the vehicle brakes are in sound working order.
- Allow for mast overhang when cornering or approaching other vehicles or structures.
- Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.
- Watch for low hanging electrical lines, particularly at the entrances to drilling sites, restaurants, motels, or other commercial sites.
- Never travel on a street, road, or highway with the mast (derrick) of the drill rig in the raised or partially raised position.
- Remove all ignition keys when a drill rig is left unattended.

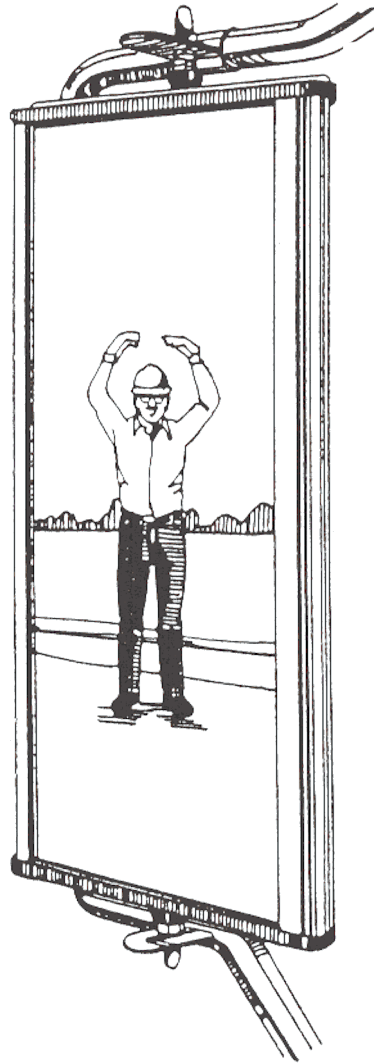
19. Loading and Unloading

When loading or unloading a drill rig on a trailer or a truck:

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the drill rig with carrier —

including tooling.

- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the drill rig carrier before approaching loading ramps.



- Distribute the weight on the drill rig, carrier, and tools on the trailer so that the center of weight is approximately on the center-line of the trailer and so that some of the trailer load is transferred

to the hitch of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.

- Secure the drill rig and tools to the hauling vehicle with ties, chains, and/or load binders of adequate capacity.

20. Off-Road Movement

Follow these procedures during off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gulleys, ruts, and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely rather than at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- Set all brakes and/or locks after the drill has been moved to a new drilling site. When grades are present, block the wheels.
- Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

21. Tires, Batteries, and Fuel

Check tires on the drill daily for safety and, during extended travel, for loss of air. Maintain air pressures for travel on streets, roads, and highways according to the manufacturer's recommendations. Only repair truck and off-highway tires with the required special tools and follow the recommendations of a tire manufacturer's repair manual.

• If tires on all-terrain drills are deflated to reduce ground pressure for movement on soft ground, reinflate the tires to normal pressures before movement on firm or hilly ground or on streets, roads, and highways. Underinflated tires are not stable on firm ground.

During air pressure checks, inspect for:

- Missing or loose wheel lugs.
- Objects wedged between duals or embedded in the tire casing.
- Damaged or poorly fitting rims or rim flanges.
- Abnormal or uneven wear and cuts, breaks, or tears in the casing.

Batteries contain strong acid. Use extreme caution when servicing batteries.

- Service batteries only in a ventilated area and while wearing safety glasses.
- When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.
- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Loosen cell caps before charging to permit the escape of gas.
- Spilled battery acid can burn skin and should be immediately flushed with lots of water. If battery acid gets into someone's eyes, flush immediately with large amounts of water and see a medical physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted or smoking materials and flames away from batteries.

Take special precautions for handling fuel and refueling the drill rig or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.
- Refuel in a well-ventilated area.

• Do not fill fuel tanks while the engine is running. Turn off all electrical switches.

• Do not spill fuel on hot surfaces. Clean any spills before starting an engine.

• Wipe up spilled fuel with cotton rags or cloths; do not use wool or metallic cloth.

• Keep open lights, lighted smoking materials, flames, or sparking equipment well away from the fueling area.

• Turn off heaters in carrier cabs when refueling the carrier or the drill rig.

• Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.

• Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.

• Do not transport portable fuel containers in the vehicle or carrier cab with personnel.

• During travel store fuel containers and hoses so they are in contact with a metal surface. This should prevent the buildup of static charge.

22. First Aid

Train at least one member of the drill crew, and if only one, preferably the drilling and safety supervisor, to perform first aid. First aid must be taught on a person-to-person basis, not by providing or reading a manual. Manuals should only provide continuing reminders and be used for reference. Courses provided or sponsored by the American Red Cross or a similar organization best satisfy the requirements of first aid training for drill crews.

For drilling operations it is particularly important that those responsible for first aid should be able to recognize the symptoms of and be able to provide first aid for electrical shock, heart attack, stroke, broken bones, eye injury, snake bite, and cuts or abrasions to the skin. Again, first aid for these situations is best taught to drill crew members by instructors qualified by an agency such as the American Red Cross.

Keep first aid kit available and well maintained on each drilling site.

23. Drill Rig Utilization

Do not attempt to exceed manufacturers' ratings of speed, force, torque, pressure, flow, etc. Only use the drill rig and tools for the purposes for which they are intended and designed.

24. Drill Rig Alterations

Alterations to a drill rig or drilling tools must only be made by qualified personnel and only after consultation with the manufacturer.